PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of:

Ayazi, et al.

Serial No.: 10/631,948

Filed: 7-31-03

Confirmation No.: 1766

Group Art Unit: 2834

Examiner: Budd, Mark Osborne

Docket No.: 062020-1430

For: Piezoelectric On Semiconductor-On-Insulator Microelectromechanical Resonators And Methods Of Fabrication

INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Sir:

This information disclosure statement is filed in accordance with 37 C.F.R. §§ 1.56, 1.97, and 1.98, and specifically:

☐ under 37 CFR 1.97(b), or
(within Three months of filing national application; or date of entry of international application; or before mailing date of first office action on the merits; whichever occurs last)

☒ under 37 CFR 1.97(c) together with either a:
- ☐ Statement Under 37 C.F.R. 1.97(e), or
- ☒ a $180.00 fee under 37 CFR 1.17(p), or
(After the CFR 1.97(b) time period, but before the final office action or notice of allowance, whichever occurs first)

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☐ under 37 CFR 1.97(d) together with a:
- ☐ Statement under 37 CFR 1.97(e), and
- ☐ a $180.00 petition fee set forth in 37 CFR 1.17(p).
(Filed after final office action or notice of allowance, whichever occurs first, but before payment of the issue fee)

Enclosed is a check in the amount of $.

Enclosed is Credit Card Payment Form (PTO-2038) in the amount of $180.00.

Please charge $ to deposit account . At any time during the pendency of this application, please charge any fees required to Deposit Account 20-0778 pursuant to 37 CFR 1.25. The Commissioner is hereby requested to credit any overpayment to Deposit Account No. 20-0778.

☒ Applicant(s) submit herewith *Form PTO 1449A - Information Disclosure Statement by Applicant* together with copies (where required) of patents, publications or other information of which applicant(s) are aware, which applicant(s) believe(s) may or may not be material to the examination of this application and for which there may be a duty to disclose in accordance with 37 CFR 1.56. As required by 37 C.F.R. §1.98(a), a legible copy of each document is provided.

☐ A concise explanation of the relevance of foreign language patents, foreign language publications and other foreign language information listed on PTO Form 1449, as presently understood by the individual(s) designated in 37 CFR 1.56(c) most knowledgeable about the content is given on the attached sheet, or where a foreign language patent is cited in a search report or other action by a foreign patent office in a counterpart foreign application, an English language

version of the search report or action which indicates the degree of relevance found by the foreign office is listed on the form PTO 1449 and is enclosed herewith.

The following rights are reserved by the Applicant(s): the right to establish the patentability of the claimed invention over any of the listed documents should they be applied as reference, and/or the right to prove that some of these documents may not be prior art, and/or the right to prove that some of these documents may not be enabling for the teachings they purport to offer.

This statement should not be construed as a representation that an exhaustive search has been made, or that information more material to the examination of the present application does not exist. Any statements or identifications regarding the relevance of any portion(s) of cited references should not be construed as a representation that the most relevant portion(s) have been identified, and the absence of such statements or identifications should not be construed as representations that there are no relevant portion(s). The Examiner is specifically requested not to rely solely on the materials submitted herewith. The Examiner is requested to conduct an independent and thorough review of the documents, and to form independent opinions as to their significance.

It is requested that the information disclosed herein be made of record in this application and that the Examiner initial and return a copy of the enclosed PTO-1449 to indicate the documents have been considered.

Respectfully Submitted,

THOMAS, KAYDEN, HORSTEMEYER & RISLEY, L.L.P.

By: _____

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I hereby certify that this correspondence is being deposited with the United States Postal Service as **"First Class Mail,"** in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on

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U.S. PATENT DOCUMENTS

Examiner Initials	Item	Document Number	Date	Name	Class	Subclass	Filing Date If Appropriate
	A	3,513,356		Newell			6-27-67
	B	3,634,787	1-11-72	Newell	333	72	1-23-68
	C	5,162,691	11-10-92	Mariani, et al.	310	321	1-22-91
	D	5,426,070	6-20-95	Shaw, et al.	437	203	5-26-93
	E	5,491,604	2-13-96	Nguyen, et al.	361	278	12-11-92
	F	5,587,620	12-24-96	Ruby, et al.	310	346	12-21-93
	G	5,589,082	12-31-96	Lin, et al.	216	2	6-7-95
	H	5,663,505	9-2-97	Nakamura	73	702	5-8-96
	I	5,719,073	2-17-98	Shaw, et al.	437	228	9-27-94
	J	5,846,849	12-8-98	Shaw, et al.	438	52	2-24-97
	K	5,847,454	12-8-98	Shaw, et al.	257	734	9-22-97

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	L	Ayazi, et al.; Capacitive Resonators and Methods of Fabrication; U.S. Patent Application Serial No. 10/632,176; filed July 31, 2003
	M	Ma, et al.; Sacrificial Layer Technique to Make Gaps in MEMS Applications; US Patent Application Publication No.: 2003/0006468 A1; filed June 27, 2001.
	N	Bourgeois, et al.; Design of Resonators for the Determination of the Temperature Coefficients of Elastic Constants of Monocrystalline Silicon; 1997 IEEE International Frequency Control Symposium; Orlando, FL.; Pages 791-799
	O	Mihailovich, et al.; Dissipation Measurements of Vacuum-Operated Single-Crystal Silicon Microresonators, Sensors and Actuators A 50 (1995); Pages 199-207
	P	Roszhart, et al.; The Effects of Thermoelastic Internal Friction on the Q of Micromachined Silicon Resonators; IEEE Solid State Sensor and Actuator Workshop, Hilton Head, SC 6/4-7/90 (1990) pp 489-494
	Q	Cleland, et al.; Fabrication of High Frequency Nanometer Scale Mechanical Resonators from Bulk Si Crystals; Condensed Matter Physics, CA Inst. of Tech.; Received June 21, 1996, Pages 2653-2655
	R	No, et al.; The HARPSS Process for Fabrication of Nano-Precision Silicon Electromechanical Resonators; IEEE Conf. of Nanotechology; October 30, 2001; Pages 489-494
	S	Water, et al.; "Physical and Structural Properties of ZnO Sputtered Films"; Dept. of EE, National Cheng Kung University; Received May 7, 2001; Pages 67-72

* EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP § 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to the applicant.

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	T	5,873,153	2-23-99	Ruby, et al.	29	25.35	8-27-96
	U	5,884,378	3-23-99	Dydyk	29	25.35	7-22-96
	V	5,894,647	4-20-99	Lakin	29	25.35	6-30-97
	W	5,914,801	6-22-99	Dhuler, et al.	359	230	9-27-96
	X	5,976,994	11-2-99	Nguyen, et al.	438	795	6-13-97
	Y	5,998,906	12-7-99	Jerman, et al.	310	309	8-17-98
	Z	6,000,280	12-14-99	Miller, et al.	73	105	3-23-98
	a	6,051,866	4-18-00	Shaw, et al.	257	417	8-11-98
	b	6,060,818	5-9-00	Ruby, et al.	310	363	6-2-98
	c	6,067,858	5-30-00	Clark, et al.	73	504.16	5-30-97
	d	6,087,747	7-11-00	Dhuler, et al.	310	90	4-1-99

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	e	DeVoe; Piezoelectric Thin Film Micromechanical Beam Resonators, Sensors and Actuators, A 88; 2001; pp 263-272
	f	Bhave, et al.; Poly-Sige: A High-Q Structural Material for Integrated RF Mems; Solid-State Sensor, Actuator and Microsystems Workshop, Hilton Head Island, South Carolina, June 2-6, 2002; pp 34-37
	g	Hsu, et al.; Q Optimized Lateral Free-Free Beam Micromechanical Resonators; Digest of Technical Papers, The 11th Int. Conf. On Solid-State Sensors & Actuators (Transducers'01), Munich, Germany, June 10-14, 2001, pp. 1110-1113
	h	Yasumura, et al.; Quality Factors in Micron- and Submicron – Thick Cantilevers; Journal of Microelectromechanical Systems, Vol. 9, No. 1, March 2000; pp 117-125
	i	Peterson, et al.; Resonant Beam Pressure Sensor Fabricated With Silicon Fusion Bonding; 6th Int. Conference on Solid State Sensors and Actuators (Transduces '91), San Francisco, CA; 1991; pp 664-667
	j	Abdelmoneum, et al.; Stemless Wine-Glass Mode Disk Micromechanical Resonators; IEEE; 2003; pp 698-701
	k	Piekarski, et al; Surface Micromachined Piezoelectric Resonant Beam Filters; Sensors and Actuators, A 91; 2001; pp 313-320
	l	Lifshitz, et al.; Thermoelastic Damping In Micro- and Nanomechanical Systems; Physical Review B; Vol. 61, No. 8; February 15, 2000; pp 5600-5609
	m	Srikar, et al.; Thermoelastic Damping In Fine-Grained Polysilicon Flexural Beam Resonators; Journal of Microelectromechanical Systems, Vol. 11, No. 5; October, 2002; pp 499-504

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	n	6,121,552	9-19-00	Brosnihan, et al.	174	253	6-13-97
	o	6,134,042	10-17-00	Dhuler, et al.	359	224	4-1-99
	p	6,215,375	4-10-01	Larson, III, et al.	333	187	3-30-99
	q	6,236,281	5-22-01	Nguyen, et al.	331	154	9-21-99
	r	6,238,946	5-29-01	Ziegler	438	50	8-17-99
	s	6,239,536	5-29-01	Lakin	310	364	9-8-98
	t	6,256,134	7-3-01	Dhuler, et al.	359	212	7-28-00
	u	6,275,122	8-14-01	Speidell, et al.	333	186	8-17-99
	v	6,275,320	8-14-01	Dhuler, et al.	359	237	9-27-99
	w	6,291,931	9-18-01	Lakin	310	364	11-23-99
	x	6,296,779	10-2-01	Clark, et al.	216	66	2-22-99

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	y	Lakin; Thin Film Resonators and Filters; IEEE Ultrasonics Symposium; 1999; pp 895-906
	z	Ruby, et al.; Ultra-Miniature High-Q Filters and Duplexers Using FBAR Technology; IEEE International Solid-State Circuits Conference; 2001; pp 120-121 & 438
	AA	Clark, et al.; High-Q VHF Micromechanical Contour-Mode Disk Resonators; IEEE; 2000; pp 493-496
	BB	Wang, et al.; VHF Free-Free Beam High-Q Micromechanical Resonators; Journal of Microelectromechanical Systems, Vol. 9, No. 3; September 2000; pp 347-360
	CC	Piazza, et al.; Voltage-Tunable Piezoelectrically-Transduced Single-Crystal Silicon Resonators on SOI Substrate; in Proc. IEEE Internatinal Microelectro Mechanical Systems Conference (MEMs '03), Koyoto, Japan, Jan. 2003
	DD	Pourkamali, et al.; A 600kHz Electrically-Coupled MEMs Bandpass Filter; MEMs '03, pp. 702-705
	EE	Pourkamali, et al.; SOI-Based HF and VHF Single-Crystal Silicon Resonators With SUB-100 Nanometer Vertical Capacitive Gaps; Transducers '03, Boston, MA; June 2003
	FF	No, et al.; Single-Crystal Silicon HARPSS Capacitive Resonators With Submicron Gap-Spacing; Solid State Sensors, Actuators and Microsystems Workshop; pp. 281-284, Hilton Head, SC; June 2002

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	GG	6,348,846	2-19-02	von Gutfeld, et al.	333	201	10-14-99
	HH	6,373,682	4-16-02	Goodwin-Johansson	361	278	12-15-99
	II	6,377,438	4-23-02	Deane, et al.	361	278	10-23-00
	JJ	6,391,674	5-21-02	Ziegler	438	52	12-28-00
	KK	6,428,713	8-6-02	Christenson, et al.	216	2	10-1-99
	LL	6,429,755	8-6-02	Speidell, et al.	333	197	1-30-01
	MM	6,433,401	8-13-02	Clark, et al.	257	524	4-5-00
	NN	6,480,645	11-12-02	Peale, et al.	385	18	1-30-01
	OO	6,485,273	11-26-02	Goodwin-Johansson	417	410.2	9-1-00
	PP	6,495,892	12-17-02	Goodman, et al.	257	414	3-26-99
	QQ	6,497,141	12-24-02	Turner, et al.	73	105	6-5-00

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	RR	Amini, et al.; Capacitive Accelerometer; IEEE International Solid-State Circuits Conference; 2000; pp 1-3
	SS	Ho, et al.; Through-Support-Coupled Micromechanical Filter Array; School of Electrical and Computer Engineering; Proc. IEEE International Micro Electro Mechanical Systems Conference (MEMS'04), Maastricht, The Netherlands, Jan. 2004, pp769-772
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	UU	Pourkamali, et al.; Electrostatically Coupled Micromechanical Beam Filters; Proc. IEEE International Micro Electro Mechanical Systems Conference (MEMS '04), The Netherlands, Jan. 2004, pp. 584-587
	VV	Amini, et al.; A High Resolution, Stictionless, CMOS Compatible SOI Accelerometer with a Low Noise, Low Power, 0.25 μm CMOS Interface; IEEE MEMS'04, Jan. 2004, pp. 572-575
	WW	Humad, et al.; High Frequency Micromechanical Piezo-On-Silicon Block Resonators; IEEE; 2003

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	XX	6,555,201	4-29-03	Dhuler, et al.	428	137	5-15-00

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	YY	Abdolvand, et al.; Thermoelastic Damping in Trench-Refilled Polysilicon Resonators; IEEE; 2003; pp 324-327
	ZZ	Sundaresan, et al.; A 7-MHz Process, Temperature and Supply Compensated Clock Oscillator in 0.25μm CMOS; Proc. of International Symposium on Circuits and Systems (ISCAS) 2003, vol. 1, pp. 693-696, May 2003
	aa	No, et al.; Single-Crystal Silicon HARPSS Capacitive Resonators With Submicron Gap-Spacing; Solid-State Sensor, Actuator and Microsystems Workshop, Hilton Head Island, South Carolina, June 2-6, 2002; pp 281-284
	bb	Balaraman, et al.; Low-Cost Low Actuation Voltage Copper RF MEMS Switches; IEEE; 2002; pp 1225-1228
	cc	Dalmia; Design of Inductors in Organic Substrates For 1-3 GHz Wireless Applications; IEEE; 2002; pp 1405-1408
	dd	Dalmia, et al.; High-Q RF Passives on Organic Substrates Using a Low-Cost Low-Temperature Laminate Process; Proc. 2002 Symposium on Design, Test, Integration and Packaging of MEMS/MOEMS (DTIP 2002), Cannes, France, May 2002, pp. 660-669
	ee	Ayazi, et al.; A High Aspect-Ratio Polysilicon Vibrating Ring Gyroscope; Solid-State Sensor and Actuator Workshop, Hilton Head Island, South Carolina, June 4-8, 2002; pp 289-292
	ff	Ayazi, et al.; High Aspect-Ratio Dry-Release Poly-Silicon MEMS Technology for Inertial-Grade Microgyroscopes; IEEE; 2000; pp 304-308
	gg	Ayazi, et al.; Design and Fabrication of A High-Performance Polysilicon Vibrating Ring Gyroscope; IEEE; 1998; pp 621-626
	hh	Selvakumar, et al.; A High Sensitivity Z-Axis Torsional Silicon Accelerometer; The International Electron Devices Meeting; San Francisco, CA; Dec. 8-11, 1996
	ii	Hao, et al.; An Analytical Model for Support Loss in Micromachined Beam Resonators With In-Plane Flexural Vibrations; Sensors and Actuators, A 109; 2003; pp 156-164

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	jj	Pourkamali, et al.; High-Q Single Crystal Silicon HARPSS Capacitive Beam Resonators With Self-Aligned Sub-100-nm Transduction Gaps; Journal of Microelectromechanical Systems, Vol. 12, No. 4; August 2003; pp 487-496
	kk	Ayazi; The HARPSS Process for Fabrication of Precision MEMS Inertial Sensors; Mechatronics 12; 2002; pp 1185-1199
	ll	Ayazi; A HARPSS Spolysilicon Vibrating Ring Gyroscope; Journal of Microelectromechanical Systems; Vol. 10, No. 2; June 2001; pp 169-179
	mm	Ayazi, et al.; High Aspect-Ratio Combined Poly and Single-Crystal Silicon (HARPSS) MEMS Technology; Journal of Microelectromechanical Systems; Vol. 9, No. 3; Sept. 2000; pp 288-294
	nn	Ayazi, et al.; High Aspect-Ratio Polysilicon Micromachining Technology; Sensors and Actuators; 87; 2002; pp 46-51
	oo	Yazdi, et al.; Micromachined Inertial Sensors; Proceedings of the IEEE; Vol. 86, No. 8; August 1998; pp 1640-1659

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